UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/920,891	08/02/2001	Michael Kwan	A4231/T34410	9729

32588 7590 01/02/2003

APPLIED MATERIALS, INC.
2881 SCOTT BLVD. M/S 2061
SANTA CLARA, CA 95050

EXAMINER	
KACKAR, RAM N	

ART UNIT	PAPER NUMBER
1763	16

DATE MAILED: 01/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/920,891	KWAN ET AL.	
	Examiner	Art Unit	
	Ram N Kackar	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 November 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *17-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *17-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *12* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims17-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hong et al (US patent Number 5990000) in view of Papasouliotis et al (US patent Number 6030881).

Hong et al disclose a computer readable storage medium having a computer readable program embodied therein (See Col 6 line 58-65), for controlling the mixture of gases, chamber pressure, temperature, RF power level, pedestal position and other parameters of a process for deposition of a dielectric layer according to a three-step deposition/etch back/deposition process (See Fig 2A 230-245) so that it covers plurality of raised features and at least partially fills in gaps. (See Col 15 line 30-33).

Hong et al do not disclose that the deposition part of their three-step process could be a simultaneous deposition/Etch process. Consequently they do not disclose a mixture of deposition and inert gas and the ratio of deposition and sputter etch.

Papasouliotis et al disclose a multi step process using a mixture of deposition and an inert gas and teach that the ratio of deposition/etch for the simultaneous deposition and etch in first and third step, should be greater than 1 and preferably between 4 and 50 to ensure net deposition (Abstract and Col 4 line10-16).

There fore it would have been obvious to one having ordinary skill in the art at the time invention was made to modify the simple deposition steps (Step 230 and 245 of Fig 2A) of Hong et al's to simultaneous deposition/sputter steps by using a mixture of deposition and inert gas and maintain the ratio of Deposition/Sputter greater than 1 in order to have net deposition over gaps of high aspect ratios and be able to fill the bottom of the gap better before the closure of the gap at the top.

Regarding Claim 17 (c,d) and 20(g(iii-iv) Hong et al disclose a chemical etch step (Step 235 Fig 2A) after the first deposition step.

Hong et al do not explicitly disclose a substrate-cooling step before starting etchant gases.

Papasouliotis et al disclose changing temperature before transition from deposition to etching (Col 8 lines 42-45).

Since the deposition step is typically done at a higher substrate temperature (See Col 4 line 24, Step 210 Fig 2A and US Patent 5937323 Col 1 line 30-34) and chemical etch depends upon temperature, it would have been obvious to one having ordinary skill in the art at the time invention was made to bring substrate to a lower temperature after deposition step was done so as to be able to control the substrate temperature adequately during subsequent etch.

3. Claims17 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hong et al (US patent Number 5990000) in view of Papasouliotis et al (US patent Number 6030881) and in view of Wang et al (US 6268274).

Hong et al disclose a computer readable storage medium having a computer readable program embodied therein (See Col 6 line 58-65), for controlling the mixture of gases, chamber pressure, temperature, RF power level, pedestal position and other parameters of a process for

deposition of a dielectric layer according to a three-step deposition/etch back/deposition process (See Fig 2A 230-245).

Hong et al do not disclose that the deposition part of their three-step process could be a simultaneous deposition/Etch process. Hence, they do not disclose a mixture of deposition and inert gas, the ratio of deposition and sputter etch and a substrate cooling step before starting etchant gases.

Papasouliotis et al disclose a multi step process using a mixture of deposition and an inert gas and teach that the ratio of deposition/etch for the simultaneous deposition and etch in first and third step, should be greater than 1 and preferably between 4 and 50 to ensure net deposition (Abstract and Col 4 line10-16). Papasouliotis et al also disclose changing temperature before transition from deposition to etching (Col 8 lines 42-45).

Papasouliotis et al do not explicitly disclose that the changing of temperature would be a cooling step.

Wang et al disclose a HDP-CVD process to fill a dielectric layer having a cooling period after a deposition/etch step to make sure that there is no damage due to accumulative heating of the substrate (Col 5 lines 8-21)

There fore it would have been obvious to one having ordinary skill in the art at the time invention was made to have a cooling step before etch step so as to avoid overheating of the substrate.

Response to Amendment

Applicant's latest arguments filed 11/25/2002 have been considered but found to be non persuasive.

Applicant's arguments:

1 Applicant asserts that no Prima Facie case of obviousness has been established since no prior art Dep/Etch/Dep reference disclosing a cooling step has been cited by the office.

2 The claims are allowable based on the allowance of claim 1 of the parent application.

Examiners response:

1 This argument is not agreed to for two reasons:

1.1 Papasouliotis et al have clearly stated the need to alter temperature before transition from deposition to etching (Col 8 lines 42-45) and the inherent reason is due to Etch being very sensitive to temperature. The recommendation for cooling before etch is supported by (US 5316278 to Sherstinsky et al -Col 1 lines15-26) and (US 6310755 to Kholodenko et al - Col 1 lines 56-60).

1.2 Another reference (US 6268274 to Wang et al- Col 5 lines 8-22), which discloses multiple dep/etch steps to fill dielectric gaps, does disclose cooling step after a deposit step.

2 The examination of these claims relies on the disclosure in the prior art in view of the guidelines of MPEP 2106 regarding computer related inventions.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ram N Kackar whose telephone number is 703 305 3996. The examiner can normally be reached on M-F 8:00 A.M to 5:P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on 703 308 1633. The fax phone numbers for the

organization where this application or proceeding is assigned are 703 872 9310 for regular communications and 703 872 9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308 0661.

RK
December 27, 2002